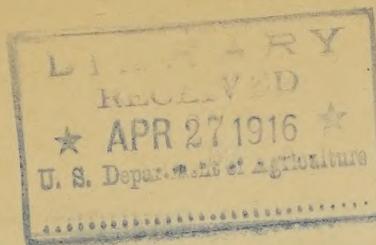


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# AGRICULTURAL EDUCATION MONTHLY.

U. S. DEPARTMENT OF AGRICULTURE,  
STATES RELATIONS SERVICE.

## AGRICULTURAL INSTRUCTION DIVISION.

Vol. II, No. 4.

April, 1916.

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## POTATO PRODUCTION.

### SUGGESTIONS FOR TEACHING THE SUBJECT IN SECONDARY SCHOOLS.

#### INTRODUCTION.

Next to Indian corn the potato is the most important contribution of America to the food supply of the world. Probably no crop except rice is eaten by a greater number of people. In the more thickly populated sections of northern Europe the potato is now the most important of human foods. As our American population increases the potato will become more important in this country, as there is no crop which will give such a large yield of food suitable for man, under such varying conditions.

In the teaching of agriculture we are training farmers for the future. The world should be better fed as a result of our teaching. The importance of the potato as a crop and the fact that it can be grown successfully in every State in the Union should give it a place in courses in general agriculture and farm crops in nearly every school where such subjects are taught. The immediate aim in teaching this subject may be to aid in securing a production of better potatoes at a lower cost, but if the subject is handled as it should be it will be a medium for developing and applying many of the general principles of plant production. If it is possible to apply the information in a practical way to the production of potatoes at home upon the student's own responsibility, it will not only have greater agricultural value, but it also will have a broader educational value, doing much toward developing the student into a self-reliant husbandman.

#### RELATION OF SUBJECT TO COURSE OF STUDY.

*Relation to agricultural courses.*—Where potatoes are grown mostly as a field crop, the subject will fit best into the general course in agronomy or a special course in field crops. In the Southeastern States or other sections where the potato is grown mostly as a truck crop, it may be considered best as a phase of general horticulture or a special course in vegetable gardening. In schools teaching a general course in agriculture in sections where potato growing is important, the subject may be utilized as a means of applying the general principles of plant husbandry.

*Seasonal sequence.*—The greater part of this subject will fit into the spring season best, although it will afford material for the entire year. As most of the care and cultivation of the

crop comes during the summer vacation months, the classroom discussion of these topics must come out of season. In most sections a practical study of methods of harvesting and marketing must be made in the fall. A study of varieties may be made just after the potatoes are harvested or just before they are planted. As the adaptation of the subject to a seasonal order of sequence is a matter of local application, the topics under classroom discussion are arranged according to a logical order.

*Correlations.*—In applying the vocational aim to the teaching of this subject emphasis will be placed upon the practice involved, yet, if that practice is to be applied in an intelligent and efficient manner, the students must understand the principles upon which it is based. Secondary students have reached an age where they may reason in a better way than elementary students. With more time and equipment for science the secondary school should aid its students in answering why things are done as well as assist them in learning how to do them. The principles of plant production are principles of most of the natural sciences with agricultural application. If these sciences are taught as separate branches the teacher of agriculture should consider the science the students have studied and show its application to the subject he is teaching. Where courses covering the science involved have not been studied it will be necessary for the agricultural instructor to consider elemental principles before he attempts to make any agricultural application. The greater part of potato production is based upon the botanical principles underlying plant behavior. There is need for knowledge of the lower plant organisms in considering the fungus diseases of potatoes, and some knowledge of zoology is required in the control of animal pests. There is also a demand for some knowledge of chemistry if the pests are controlled by spraying. Chemistry is also involved in a study of plant growth, the soil, and the application of fertilizers. Where domestic science is taught there should be cooperation and correlation in considering the food value of potatoes and the cooking qualities of different varieties of potatoes grown under different conditions.

#### CLASSROOM INSTRUCTION.

*Use of reference material.*—The subject of potato production as treated in most textbooks on general agriculture, vegetable gardening, or field crops should be reinforced with other reference material in potato-growing sections. The books which are devoted entirely to the potato treat the subject too extensively for most secondary schools to follow closely. Reference may be made to these books upon such topics as have a bearing upon the lessons outlined. The most important topics should be assigned to the whole class; other topics of interest may be assigned to individual students for special reports, either to be given orally before the class, or to the teacher in written form. Teachers who have no other general reference material will find that the department publications, which are listed at the end of this article, treat the subject with sufficient completeness for most courses. It is necessary to adapt the course to the community, as well as to the student; in accomplishing this the publications of the State college and State department of agriculture should be used. In connection with a potato survey, the teacher and his students should make a study of methods used by potato growers of the district and utilize this knowledge in making local adaptations.

*Use of illustrative material.*—Continuous effort should be made to visualize the lesson. As potatoes may be secured at any time of the year, there is little excuse for attempting to study the potato without having specimens before the students which represent common varieties grown in the district. The pupils should be encouraged to study the potato plant in the field during the different stages of its growth and development. It is especially important that they understand the relation of the new tubers to the seed tuber and the root system of the plant. As this stage of development comes when school is not in session, a diagram showing the plant

as a whole will be found useful. The accompanying illustration (fig. 1) may be copied on the blackboard or made into a chart. Charts may be used also to show the composition of potatoes<sup>1</sup> in a diagrammatic manner and to illustrate types in connection with such specimens as may be obtained. Diagrams showing production and prices of potatoes from 1868 to 1912 will be found on page 5 of Farmers' Bulletin 533, Good Seed Potatoes and How to Produce Them. The production of potatoes by States for 1899 and 1909 is shown diagrammatically on page 652 of Volume V of the Thirteenth Census of the United States.

*Characteristics of the potato plant.*—To understand methods of potato requirements for growth. The following questions are suggestive of the treatment of these topics: To what botanical family does the potato belong? What is the nature of some of its wild relatives? What proof can you furnish that the potato is related to the tomato? What is the relation of the common or "Irish" potato to the sweet potato? (A comparison of common potatoes with sweet potatoes will bring out the difference between tubers and roots. It will be interesting to note the arrangement of eyes upon the tuber and trace their relationship to buds.) Are the buds single or does more than one shoot develop from an eye? (A clear distinction should be drawn between the so-called seed potatoes and the real seed produced in the fruit. A comparison of the fruit of the potato with that of the tomato may be made with profit.) Why do not all varieties of potatoes produce fruit? Why can not we expect the same development and uniformity in seedling potatoes as in those resulting from the planting of tubers? How may new varieties of potatoes be developed?

*Requirements for successful culture.*—A student may be given a special assignment to find out what he can regarding the native home of the potato and report to the class the relation of its nativity to its requirements. What sections of the United States furnish ideal climatic conditions for the potato? How does it adapt itself to other sections? What relation is there between the amount of sunlight and the food value and quality of potatoes? (This question should lead to a short review and an application of the fundamentals of photosynthesis.) Describe an ideal potato soil. To what extent will the potato adapt itself to varying soil conditions? Why is the texture of the soil of special importance in the case of potato culture? (Samples of good potato soil should be compared with samples of soil unsuited to the crop.) What are the requirements of the crop

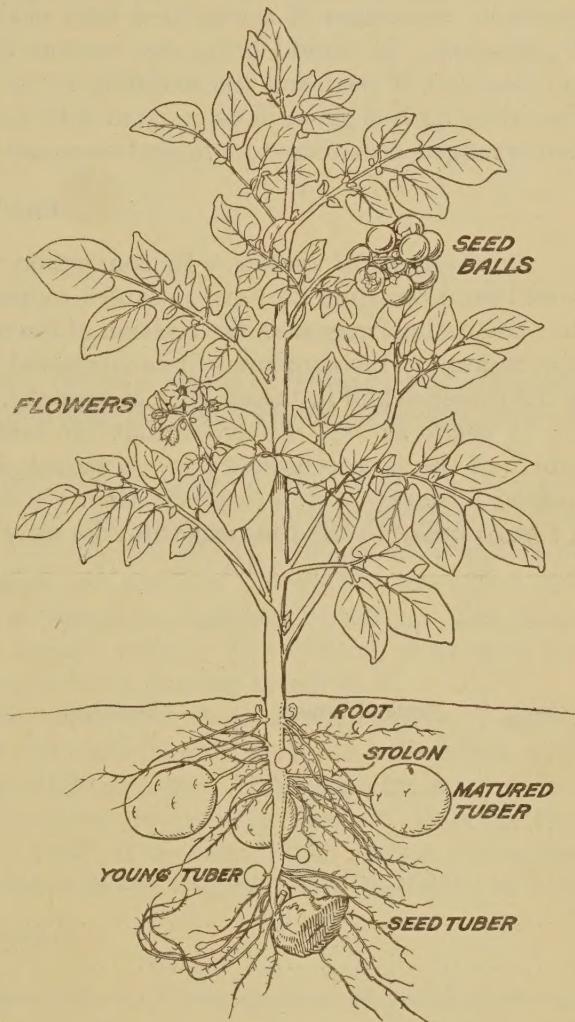


FIG. 1.—Chart for teaching parts of potato plant.

<sup>1</sup> A series of 15 charts published by the Office of Home Economics, States Relations Service, showing the composition of food materials may be obtained from the Superintendent of Documents, Washington, D. C., for \$1. This set of charts includes the composition of the potato shown in graphic form.

with regard to water? What is the relation of the texture and depth of the soil to its water-holding capacity? (Special emphasis should be given to the water requirements of the crop in semiarid sections and in arid regions where irrigation is practiced.)

*Potato culture.*—The foregoing topics may be considered as preliminary to the main discussion of the subject. They are important in so far as they have a bearing upon methods of production which should now be taken up. It should be borne in mind that the practice of potato production may be learned best in connection with the practicums and projects. The classroom discussion of the subject may deal more largely with the principles which underlie the practice. It should bring out reasons for methods of planting, tillage, control of pests, the selection of seed and the handling of the crop as well as suggest the best method to use. The study outline given in connection with the production project will suggest topics for discussion arranged according to a logical sequence.

#### PRACTICUMS.

*Development of sprouts.*—In connection with a study of types and varieties of potatoes it will be interesting to have potatoes representing different types sprouted at the school so that the student may note the relation of the nature of the sprouts to the type of potato. Along with this study the students will be interested in noting the difference between potatoes sprouted in the presence and in the absence of sunlight.

*A potato survey.*—In order that the instructor may gain accurate information as to the extent of the potato industry in his school district, he should have the students assist him in making a survey of potato production. A study of methods may be made at the same time. A form similar to the following may be used:

*A potato survey.*

No.	Name of farmer.	Location.	Acres in potatoes.		Yield.		Varie-ties.	Special methods.
			Early.	Late.	Total.	Per acre.		
1.....								
2.....								
3.....								
4.....								

*Scoring and judging.*—Students should have practice in scoring and judging potatoes as a basis for selection of seed potatoes, as a means of becoming acquainted with types and varieties, and as an aid toward selection of specimens which they may exhibit. One of the best ways to secure material for such practice is to have an exhibit of potatoes at the school. This exhibit should be open to adult patrons as well as to the boys and girls, though it is well to have senior and junior classes in case of contests for prizes. Although some competent judge should make decisions in the contests, the students should be given repeated practice in scoring and placing of exhibits according to various standards of merit. The following score card is suggested by the Office of Extension Work, North and West, of this service:

## POTATO SCORE CARD FOR TEN TUBERS.

SUGGESTED FOR USE IN TEACHING THE ESSENTIAL POINTS OF GOOD SEED POTATOES AS WELL AS TO SHOW WHAT CONSTITUTES A GOOD MARKETABLE POTATO.

	Score points.	1	2	3	4	5	6	7	8	9	10
(1) Uniformity as to size of 10-tuber exhibit.....	15										
(2) Trueness to type.....	15										
(3) Size (desirability).....	10										
(4) Shallowness of eyes.....	10										
(5) Freedom from scab and surface blemishes.....	15										
(6) Color and smoothness of skin.....	15										
(7) Color of flesh.....	10										
(8) Condition of flesh as to food value, amount of starch, etc.....	10										
Total score.....	100										

*Making starch.*—The making of starch for home use is a means of utilizing unmarketable potatoes. A recipe for starch making may be obtained from the States Relations Service, Office of Extension Work, North and West.

*Treatment of seed for scab.*—The treatment of potatoes for scab may be easily carried on at the school as a class practicum by either of the following methods: *Formalin treatment*—The seed tubers should be immersed for two hours in a solution of 1 pint of formalin to 30 gallons of water. *Corrosive sublimate treatment*—Soak the uncut seed one and one-half to two hours in a solution made by dissolving 4 ounces of corrosive sublimate in 30 gallons of water. Hot water must be used, as the material is almost insoluble in cold water. The solution is exceedingly poisonous and must be guarded to prevent children or stock gaining access to it.

*Spraying for control of insect pest and plant diseases.*—The class should be given practice in the mixing of Paris green for the control of the Colorado potato beetle and Bordeaux mixture for the control of such diseases as the early-blight fungus. Directions for mixing and applying these sprays either separately or in combination are given in Farmers' Bulletin 407. Whenever the school may secure the use of a spray outfit, if the school is in session during the time for spraying, the students should be given practice in the application of the spray as well as its preparation.

## A HOME PROJECT.

If it is possible to have each of the students grow one-half acre or more of potatoes on his own account, there will be opportunities for practice in all of the details of potato culture and application of the principles discussed in the classroom. Such a home project will give additional development through the responsibility which the student assumes in management. Wherever the potato-growing club projects are connected in a definite way with the instruction of the school, such projects may be considered as home projects. The following study outline should prove helpful to the student in planning his project and useful to the teacher in connecting the work of the classroom with the practical work at home. Each student should make a careful record of costs, receipts, time spent, and work done, this record to form the basis of a written report to the teacher.

## POTATO-PROJECT STUDY OUTLINE.

## GROWING AN ACRE OF POTATOES—A PRODUCTION PROJECT.

- I. Shall I grow potatoes for my project?
  1. Is this section adapted to potatoes?
  2. Is my soil suitable for growing potatoes?
  3. Can I control all pests and diseases which prevail in this district?
  4. Is there a good prospect for potatoes paying a profit this year?
- II. What shall be my aim in potato production?
  1. Shall I grow late potatoes for winter use?
  2. Shall I grow early potatoes for the market?
  3. Shall I grow potatoes for seed?
  4. Shall I make a combination of the aims above?
  5. To which is my soil best adapted?
  6. Which offers the greatest prospect for returns?
  7. Which will fit in best with my work at home and at school?
- III. How shall I prepare my land?
  1. Has the previous crop and treatment of the land left it in suitable condition?
  2. What crop should I use to prepare the soil for a future potato crop?
  3. When and how should barnyard manure be used for a crop of potatoes?
  4. Can I afford to use commercial fertilizers on my potato land? If so, how much and of what kind?
  5. When shall I plow, and how deep?
  6. What other preparation is necessary?
- IV. What seed shall I plant?
  1. What varieties are grown in this district?
  2. Are there better varieties which would suit local conditions and my particular needs?
  3. Shall I buy home-grown seed?
  4. Shall I pay extra for selected seed?
- V. How shall I plant my seed potatoes?
  1. When shall I plant?
  2. Shall I let my seed sprout before planting?
  3. How shall I cut the seed potatoes?
  4. Is there any danger from scab? If so, how shall I treat my seed potatoes to prevent infection?
  5. What is the proper depth and distance for planting?
- VI. How shall I cultivate my potatoes?
  1. What are the purposes of cultivation which I should bear in mind?
  2. What cultivation may they need before they are out of the ground?
  3. Shall I practice level culture or the hill method?
  4. What type of cultivator will serve my purpose best in row cultivation?
  5. When and for what purpose shall I use a hoe?
  6. What particular weeds must I guard against?
- VII. How can I control insect pests and potato diseases?
  1. What are the prevalent insect pests and diseases of potatoes in this district?
  2. What spray mixture will kill a biting insect like the Colorado potato beetle?
  3. How shall I make Bordeaux mixture if fungus diseases are threatening?
  4. Can I use a combination that will destroy insects and prevent disease?
  5. What kind of spraying outfit will best serve my needs?
  6. Will it pay me to buy a spray outfit or hire my spraying done?
- VIII. How shall I select my seed potatoes for next year?
  1. Shall I mark some of the promising plants and make a hill selection?
  2. Shall I depend upon selection from the bin or upon the purchase of selected potatoes?
- IX. How shall I handle my potato crop?
  1. When shall I harvest my potatoes?
  2. Shall I dig my potatoes by hand, use a plow, or hire some one to dig them by machinery?
  3. Shall I store my potatoes or market them direct from the field?
  4. How shall I grade them?
  5. What shall I do with my culls?

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Farm Management in Northern Potato-Growing Sections. U. S. Dept. Agr., Farmers' Bul. 365 (1909).  
 Potato Culture on Irrigated Farms of the West. U. S. Dept. Agr., Farmers' Bul. 386 (1910).  
 The Potato as a Truck Crop. U. S. Dept. Agr., Farmers' Bul. 407 (1910).  
 Good Seed Potatoes and How to Produce Them. U. S. Dept. Agr., Farmers' Bul. 533 (1913).  
 Potato-Tuber Diseases. U. S. Dept. Agr., Farmers' Bul. 544 (1913).  
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 Syllabus of Illustrated Lecture on Potato Diseases and Their Treatment. U. S. Dept. Agr., Office of Experiment Stations Farmers' Institute Lecture No. 2 (rev. 1907).  
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 Group Classification and Varietal Descriptions of Some American Potatoes. U. S. Dept. Agr. Bul. 176 (1915).  
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## INSTRUCTION IN STRAWBERRY GROWING FOR SECONDARY SCHOOLS.

## INTRODUCTION.

As the strawberry adapts itself to a wide range of latitude and to great extremes in environment, it is grown successfully in every State in the Union. It is the most valuable and popular of all the small fruits grown in the United States. The fact that the strawberry is very popular with young people and that it may be grown under such a variety of conditions either on an extensive scale or in a limited way, even as a part of the kitchen garden, should make its production a popular project in connection with the practical teaching of agriculture.

## RELATION OF SUBJECT TO COURSE OF STUDY.

*Place in agricultural courses.*—Strawberry growing should find a place in general agriculture in districts where strawberries are an important crop. In such districts a project in strawberry growing may be used to illustrate and apply the principles of plant production. As strawberry production is essentially a phase of horticulture it should form part of a general course in horticulture or a special course dealing with small fruits. Although strawberries are classified in this country with other common berries as small fruits and may well be considered with them in connection with handling the fruit, the nature of the plants and the culture given them would make a classification with garden vegetables more logical. As strawberry growing involves some of the principles and practices of both fruit growing and vegetable gardening, it makes a good project in connection with general horticulture.

As the time given to the subject will depend upon the importance of the crop in the district, the teacher should determine early the extent to which strawberries are grown and for what purpose. The students should aid in this survey work, using a form similar to the one suggested for potatoes on page 29 of this number. Considerable information concerning methods used should be secured in such a survey.

*Correlation with other subjects.*—The production of strawberries calls for special application of the principles of botany. The strawberry bed is drawn upon for material of considerable interest in botanical instruction. The nature of the perfect and imperfect flowers, the fruit, and the means of asexual propagation are commonly cited in botany texts. A consideration of the diseases of strawberries calls for the application of more advanced botany. The strawberry bed will also furnish material for the class in zoology in the form of insects, slugs, snails, and other small animals, some of which are found as parasites upon the plants. The mixing of sprays to control these pests and the mixing and application of fertilizers call for some practical knowledge of chemistry. If the students have not had courses covering these branches of science it will be necessary for the class in agriculture to take more time in a discussion of those

elements of science. To understand how plants grow the students must know something of the elements which make up plant food and the form and manner in which these elements are used. To control pests and diseases they must know something of their nature. If these essential fundamentals have been considered in connection with science courses, they should be reviewed in their application to the phase of agriculture under consideration.

The teacher of agriculture should utilize the opportunities given him to review and apply general information which the students are supposed to have received in their former schooling. For example, in discussing the origin of the strawberry it will be brought out that the common species came from Chile. It should not be assumed that all students remember the physiographic conditions under which the plant grows in that country. There is frequent opportunity for the review of geography, history, and other general subjects, in the teaching of agriculture.

#### CLASSROOM INSTRUCTION.

*Use of reference material.*—The outline given in connection with the home project will suggest topics for discussion arranged in a logical order. Most of these questions may be answered from a study of Farmers' Bulletins 198, Strawberries, and 664, Strawberry Growing in the South. The latter bulletin will be found especially helpful in adapting the subject to the Southern States. Some of the States have published bulletins of a general nature upon strawberry growing which should prove helpful in adapting the subject to local conditions. There are several books which treat the strawberry in a special way which may be used by the teacher and by students who wish to go into a more extensive study of the subject in connection with their projects.

*Use of illustrative material*—If the school is in session when ripe strawberries may be obtained, the students may learn of the characteristics of the important varieties suitable to the district by a study of the fruit. If the fruit can not be obtained, good illustrations may be used in substitution. Some of the firms which sell plants issue illustrated catalogues which may be used to advantage. In a study of the plant there is little excuse for not having concrete material at hand. If the class can not go to the garden the plants may be brought into the classroom. A field trip will be found profitable for studying methods of culture and the handling of the crop as well as for studying the growth of the plants. The field trip should be planned in a definite way, and the students required to take notes and make a written report.

#### PRACTICUMS.

*Planting.*—Although the setting of strawberry plants is a simple operation, it requires care as to details. The students should have an opportunity to set plants according to directions given in Farmers' Bulletin 198.

*Picking and packing.*—In sections where berries are grown extensively for the market many school children are employed in picking and packing. The growers often have difficulty in getting this work properly done. If such work is commenced before the summer vacation, the instructor in agriculture may aid the community by giving his students practical training in the proper methods of handling berries. If the school does not own a farm, it should be possible to use a neighboring farm for the purpose of giving the students practice.

*Making equipment.*—In connection with the instruction in farm mechanics or mechanic arts the students may make shipping crates, picking stands or carriers, and packing tables. The material for shipping crates is usually furnished ready-made, but the nailing of this material requires skill and efficiency which may be given an impetus in the school shop.

HOME PROJECTS.<sup>1</sup>

The following separate projects are suggested as fitting in with a study of strawberry growing:

1. Production of strawberries on one-tenth acre or more.
2. Establishing a strawberry bed.
3. Care and management of an established bed.
4. Production and sale of strawberry plants.

The first project involves setting the plants and the care of the bed until profitable returns are secured from the sale of berries. The difficulty in requiring such a project is that it will require more than one season, while a course in horticulture does not, as a rule, cover more than one year. We may divide the work as suggested in projects 2 and 3, but either will lack the full experience of strawberry production. If it is possible for the student to secure the management of an established bed and at the same time start a new bed in part or in whole, he will have a complete project in strawberry production, especially if he treats some of the bed with a view of producing good plants to sell or to use in planting at home. The following outline assumes the possibility of such a combination of the projects suggested:

## STRAWBERRY-PROJECT STUDY OUTLINE.

- I. Shall I grow strawberries as my project?
  1. Shall I take hold of the home strawberry bed, or a part of it, on my own account?
  2. Shall I start a new bed?
  3. Is my soil suitable for strawberries?
  4. Will strawberries pay a profit?
  5. Have I a suitable market?
- II. What shall be my aim in growing strawberries?
  1. Shall I produce berries for home use and for a local market?
  2. Shall I grow berries for shipping?
  3. Shall I endeavor to produce plants for sale and for the purpose of extending and renewing my bed?
  4. Shall I make a combination of the aims above?
- III. How shall I prepare the land?
  1. What is the best kind of a crop to precede strawberries?
  2. Why are corn and cowpeas recommended?
  3. Why is sod land usually to be guarded against?
  4. Why is deep plowing and a thorough pulverizing of the surface soil important?
  5. Will it be necessary to plant upon raised beds or ridges?
  6. Under what conditions will flat culture give the best results?
- IV. How shall I increase the fertility of my soil?
  1. What does my soil lack to make it ideal for growing strawberries?
  2. Shall I use barnyard manure to improve its physical condition?
  3. At what time should fresh manure be applied?
  4. Why should manure be well decomposed if applied near the time of planting?
  5. Can I use commercial fertilizers to advantage?
  6. How may I determine what elements are lacking?
  7. Can I buy the materials and mix the fertilizers needed?
  8. When should commercial fertilizers be applied?
- V. What system of planting shall I use?
  1. What are the advantages and disadvantages of the hill system?
  2. What are the advantages and disadvantages of the matted-row system?
  3. What are the advantages and disadvantages of the hedge-row system?
  4. What system is used most in this section?
  5. What system is best adapted to my needs?

<sup>1</sup> See U. S. Dept. Agr. Bul. 346, Home Projects in Secondary Courses in Agriculture, for directions for conducting a home project.

## VI. How shall I plant my strawberries?

1. What factors influence the time of planting?
2. What will be the best time for me to plant?
3. What varieties shall I plant?
4. How are good plants produced?
5. Can I secure good plants at home?
6. From whom may I secure good plants of the varieties I desire?
7. What care is given plants which may be received some time before planting?
8. Have I provided in my plan of planting for the pollination of imperfect varieties?
9. At what distance shall the plants be set?
10. What method shall I use in planting?
11. What are the essentials to be kept in mind in setting strawberry plants?
12. Why should special care be given to the depth of planting?
13. What preparation should be given the plant before it is set?
14. How may I provide against dry weather at planting time?

## VII. How shall I cultivate my strawberries?

1. What are the purposes of cultivation?
2. What weeds must I guard against?
3. What kind of a cultivator shall I use?
4. To what extent must hoeing and handwork supplement the cultivator?

## VIII. What other phases of care and management will be needed?

1. What are the objects of mulching?
2. What mulching material may I use to the best advantage?
3. When shall I apply the mulch?
4. What factors will determine the duration of a bearing bed?
5. How long shall I allow the patch to produce?
6. What treatment should be given an old bed before replanting?
7. What system shall I use in renewing my bed?
8. What are the advantages of a rotation of crops in relation to strawberry growing?
9. What are the advantages of burning?
10. What is the best system of rotation for me to follow?
11. What insect enemies and plant diseases must I guard against?
12. What are the best methods of controlling the pests which prevail in this section?

## IX. How shall I harvest my berries?

1. Shall I aim to supply a local or distant market?
2. At what stage of maturity should berries be picked for each of these markets?
3. How should the berries be picked?
4. Why is it important to leave the stems on?
5. What are the advantages of careful grading and packing?
6. Shall I grade the fruit at the time of picking?
7. What are the best systems of grading and packing?
8. What special care do strawberries require after they are picked?
9. What kind of packages does the market I intend to supply require?
10. Can I make the necessary picking trays, packing tables, and such other equipment as I may need?
11. Why is it important to provide for pickers and packing supplies before the harvest season?
12. What should it cost me to grow an acre of strawberries?
13. What returns may I expect to receive?

## X. How may I conduct special features of production?

1. What are the possibilities in winter forcing?
2. What are the requirements of successful forcing?
3. What are the requirements in developing a trade for strawberry plants?
4. How may a surplus be taken care of by forms of preservation and canning.

